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Modeling the Economic Contribution of Junior Achievement via Community Service to a Community's Economic Development: An Economic Theoretical Analysis

Tin-Chun Lin

School of Business and Economics, Indiana University Northwest, Gary, IN, USA
Email: tinlin@iu.edu

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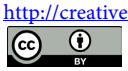

Abstract

The Junior Achievement (JA) program offers free lessons (e.g., financial literacy, work readiness, and entrepreneurship), taught by volunteers, to K-12 students. These lessons positively affect young people's knowledge of financial literacy, decision-making, motivation, business administration, financial management, and ways of thinking about starting/running a business, and in turn contribute to a community's economic development. We applied the theories of producer choice and economic growth to model the economic contribution of JA via community service to a community's economic development. A survey was also distributed during this study. The JA program makes three main economic contributions: reducing the cost of education training, improving the quality of human capital used in business, and increasing effective labor used in production. Further, our theoretical model is useful in constructing empirical models for the further investigation of this topic.

Keywords

Junior Achievement, Community Service, Theory of Producer Choice, Theory of Economic Growth, Community's Economic Growth

1. Introduction

Junior Achievement (JA) in the U.S. is a nonprofit organization that provides free lessons to K-12 students who wish to gain knowledge about, insights into, and skills needed for future careers. This program was started in 1919 (founded by Theodore Vail, president of American Telephone & Telegraph; Horace Mo-

ses, president of Strathmore Paper Co.; and Senator Murray Crane of Massachusetts) and primarily focuses on three areas: workforce readiness, entrepreneurship, and financial literacy. The main purpose of this program is to stimulate youths' economic potential and assure their success in the modern global economy.

Junior Achievement lessons are taught by volunteers through a community service program. These volunteers normally visit students' classes, engage in after-school programs, or provide educational opportunities in other settings about money, jobs, and business. Volunteers are currently employed or recently retired from many different types of professions and businesses—they include parents, college professors, businesspeople, college students, etc. According to the 2021-2022 Junior Achievement Alumni Survey Report (Junior Achievement, 2022), nearly 91% of JA alumni believe that engagement in this organization motivated them to learn and enabled the attainment of their goals. More than 84% agreed that JA lessons enhanced their financial literacy and provided them with the knowledge needed to achieve a strong financial footing. These 84% also reported that they were financially independent from their parents, implying that they were doing well in managing their money and financial situations. Moreover, nearly 64% reported retaining information about money, jobs, and business taught by JA volunteers, indicating that these lessons positively impacted their careers, jobs, and lives.

JA volunteers may influence a community's economic development by sharing with budding entrepreneurs' information and insights needed about financial literacy, decision-making, motivation, business administration, financial management, and ways of thinking in starting/running a business. In this study, we used the theories of producer choice and economic growth to model the potential economic contributions of Junior Achievement to a community's economic development. Our economic theoretical model will be useful in constructing empirical models for the further investigation of this topic in the future.

2. The Model

The theory of producer choice was used in this study to construct a model to link the relationship between the Junior Achievement program and producer behavior. Suppose that a community's economic output (Y) is modeled as a function of labor (L), human capital (H), and physical capital (K), using the multiplicative Cobb-Douglas production function, which can be expressed as follows:

$$Y = AK^{\alpha}\left(LH\right)^{\beta} = AK^{\alpha}E^{\beta}, \tag{1}$$

where Y is real output, K stands for physical capital, A stands for an exogenous knowledge and technological factor, L stands for raw labor input, H stands for human capital, that consists of education program training experiences and

working experiences, $(L \cdot H)$ stands for effective labor ($E = LH$) (e.g., Lin, 2006), and α, β are physical capital and effective labor shares, respectively.

A worker cannot go to work without bringing their human capital. So, effective labor consists of both raw labor and human capital. In other words, effective labor considers a worker's labor quality in addition to just raw labor. A worker who seeks out and engages in educational training experiences (e.g., a graduate degree, such as MA or Ph.D.) and more working experiences (e.g., 30-year working experiences) will offer a higher quality of effective labor. For example, a one-hour labor contribution to the business must be greater from a CEO/manager with an MBA degree in business administration and 30 years of work experience than from an assembly line worker with 3 months of work experience and no high school degree.

A community's total economic output equals all individual firms' total real output in the community. That is: $Y = \sum_{i=1}^{n} y_i$. Let $y = y_i$. Therefore, consider a representative firm i's real output function (y), shown as below:

$$y = ak^{\alpha}(lh)^{\beta} = ak^{\alpha}e^{\beta}, \tag{2}$$

where y stands for firm i's real output, l stands for firm i's raw labor input, h stands for firm i's human capital (consisting of education program training experiences and working experiences), $(l \cdot h)$ stands for firm i's effective labor ($e = l \cdot h$), k stands for firm i's physical capital, a is an exogenous knowledge and technological factor, and α, β are physical capital and effective labor shares, respectively. Note that an individual firm's output can be regarded as the firm's business sales.

Readers should note that the Junior Achievement program is one of the education program trainings that focus on economics/business knowledge, financial literacy, money, and business management. The availability of education program training experiences improves human capital. In other words, businesses benefit from more business management training opportunities, with one result being a higher level of human capital.

Assume that the price of physical capital is P_k, the price of labor is P_l, and the price of human capital is P_h. Thus, the price of effective labor (P_e) is a function of both P_l and P_h, such as $P_e(P_l, P_h) = P_l \cdot P_h$. The maximum production cost for a firm is C. Therefore, the firm's total cost budget constraint (which is the iso-cost line) may be displayed as follows:

$$P_k k + P_e e = C. \tag{3}$$

To solve the producer's optimization problem, we maximize Equation (2) subject to Equation (3) and choose physical capital (k) and effective labor (l). Thus, the Lagrangian expression is set up as follows:

$$L = ak^{\alpha}e^{\beta} + \lambda(C - P_k k - P_e e), \tag{4}$$

where λ stands for the Lagrangian multiplier or a shadow price. Meanwhile, Equation (4) yields the following first-order conditions for the constrained

maximum:

$$\frac{\alpha a k^{\alpha-1} e^{\beta}}{P_k} = \frac{\beta a k^{\alpha} e^{\beta-1}}{P_e} \quad \text{and} \tag{5}$$

$$C = P_k k + P_e e. \tag{6}$$

Based upon Equations (5) and (6), we can solve the equilibriums of k and e:

$$k^* = \frac{\alpha}{\alpha+\beta} \cdot \frac{C}{P_k} \quad \text{and} \tag{7}$$

$$e^* = \frac{\beta}{\alpha+\beta} \cdot \frac{C}{P_e}, \tag{8}$$

where k^* and e^* mean the equilibriums of k and e. Plugging k^* and e^* into the production (y), we then can solve, y^*, the equilibrium of the producer's production:

$$y^* = a\left(\frac{\alpha}{\alpha+\beta}\frac{C}{P_k}\right)^{\alpha}\left(\frac{\beta}{\alpha+\beta}\frac{C}{P_e}\right)^{\beta}. \tag{9}$$

According to Equation (9), $\frac{\partial y^*}{\partial P_k} < 0$, $\frac{\partial y^*}{\partial P_e} < 0$, and $\frac{\partial y^*}{\partial C} > 0$. Intuitively, the higher the price of inputs, the more expensive the production cost—thus, there will be a smaller production. On the other hand, the larger the maximum cost that the firm can afford, the larger the production. In addition, we can show Equations (7), (8), and (9) graphically in Figure 1 by using iso-quant (shown by y^*) and iso-cost curves (shown by line ab), which is displayed as below:

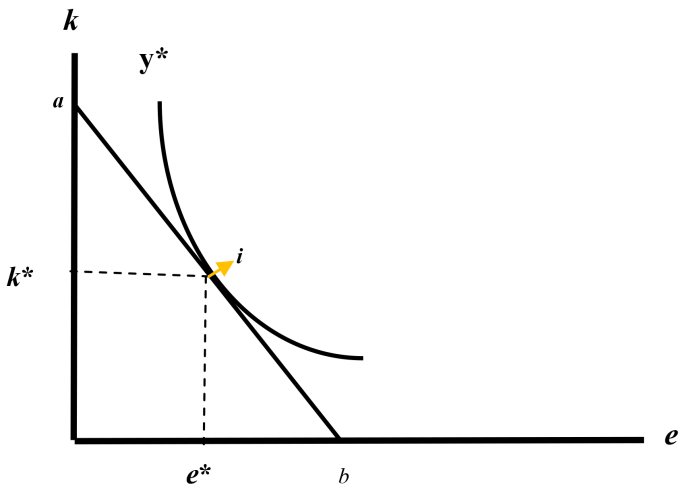

Figure 1. Equilibriums of physical capital and effective labor.

3. Comparative Static Analysis

In addition to the first-order conditions displayed in the previous section, we further show the second-order conditions by demonstrating the comparative static analysis. Hence, given constant parameters (α and β), we first completely

differentiate Equations (5) and (6) and obtain:

$$\begin{bmatrix} P_e y_{kk} - P_k y_{ek} & P_e y_{ke} - P_k y_{ee} \\ P_k & P_e \end{bmatrix} \begin{bmatrix} \mathrm{d}k \\ \mathrm{d}e \end{bmatrix} = \begin{bmatrix} 0 & y_e & -y_k \\ 1 & -k & -e \end{bmatrix} \begin{bmatrix} \mathrm{d}C \\ \mathrm{d}P_k \\ \mathrm{d}P_e \end{bmatrix}, \tag{10}$$

where $y_k = \alpha a k^{\alpha-1} e^{\beta} > 0$,

$y_e = \beta a k^{\alpha} e^{\beta-1} > 0$,

$y_{kk} = \alpha(\alpha-1) k^{\alpha-2} e^{\beta} < 0$,

$y_{ee} = \beta(\beta-1) k^{\alpha} e^{\beta-2} < 0$, and

$y_{ke} = y_{ek} = \alpha\beta k^{\alpha-1} e^{\beta-1} > 0$.

Let $|D|$ be the determinant of the pre-multiplied matrix of vector $[\mathrm{d}k \quad \mathrm{d}e]$, which is:

$$|D| = \begin{vmatrix} P_e y_{kk} - P_k y_{ek} & P_e y_{ke} - P_k y_{ee} \\ P_k & P_e \end{vmatrix} = \begin{vmatrix} - & + \\ + & + \end{vmatrix} < 0.$$

Second, we use Cramer's rule. The straight-forward comparative static analysis yields:

$$\frac{\mathrm{d}k}{\mathrm{d}C} = \frac{\begin{vmatrix} 0 & P_e y_{ke} - P_k y_{ee} \\ 1 & P_e \end{vmatrix}}{|D|} > 0, \tag{11}$$

$$\frac{\mathrm{d}e}{\mathrm{d}C} = \frac{\begin{vmatrix} P_e y_{kk} - P_k y_{ek} & 0 \\ P_k & 1 \end{vmatrix}}{|D|} > 0, \tag{12}$$

$$\frac{\mathrm{d}k}{\mathrm{d}P_k} = \frac{\begin{vmatrix} y_e & P_e y_{ke} - P_k y_{ee} \\ -k & P_e \end{vmatrix}}{|D|} < 0, \tag{13}$$

$$\frac{\mathrm{d}e}{\mathrm{d}P_k} = \frac{\begin{vmatrix} P_e y_{kk} - P_k y_{ek} & y_e \\ P_k & -k \end{vmatrix}}{|D|} > \text{or} < 0, \tag{14}$$

$$\frac{\mathrm{d}k}{\mathrm{d}P_e} = \frac{\begin{vmatrix} -y_k & P_e y_{ke} - P_k y_{ee} \\ -e & P_e \end{vmatrix}}{|D|} > \text{or} < 0, \text{ and} \tag{15}$$

$$\frac{\mathrm{d}e}{\mathrm{d}P_e} = \frac{\begin{vmatrix} P_e y_{kk} - P_k y_{ek} & -y_k \\ P_k & -e \end{vmatrix}}{|D|} < 0. \tag{16}$$

Intuitively, as Equations (11) and (12) show, an improvement in the producer's total cost-budget enhances demands for both inputs, physical capital (k) and effective labor (e). Moreover, as displayed in Equations (13) and (14), an increase in the price of physical capital reduces producer demand for physical capital (k) but does not provide a certain effect for effective labor (e). Similarly, as

demonstrated in Equations (15) and (16), an increase in the price of effective labor discourages producer demand for effective labor (*e*) but offers uncertainty about physical capital (*k*).

4. Impact of Junior Achievement on a Community's Output Growth

In this section, the isoquant curve approach is used to show how the Junior Achievement program influences a firm's output (or business sales).

When more money is available to pay for program training, there will be a higher price of human capital ($P_h \uparrow$), and hence a higher price of effective labor ($P_e \uparrow$). Any education program will cost learners money. However, the Junior Achievement program is exceptional because it is offered free of charge to learners (students). Lessons and training are delivered to students across the country through the efforts of education program partners and volunteers from the local community. The lack of a monetary cost for learners means that the price of human capital would drop ($P_h \downarrow$), as does the price of effective labor ($P_e \downarrow$).

As shown in Figure 2, suppose that all education trainings cost money (no free trainings). Given the price of physical capital (P_k), the price of effective labor (P_e), and the maximum cost (*C*) that the firm can afford, the producer's optimal choice will be (k0, e0), and his/her production will reach y0 under the initial iso-cost line *ab*. However, as mentioned above, when the Junior Achievement Program training is free of charge for learners, the price of human capital will drop and thus the price of effective labor drops, too. For that reason, the producer's iso-cost line will switch (by rotating) to line *ac,* optimal choice will move to (k1, e1), and the producer's quantity will increase to y1. In other words, to maintain the same level of quantity, the producer will be more willing to substitute more units of effective labor (*e*) for physical capital (*k*). Consequently, the producer will employ more units of effective labor (from e0 to e2) but fewer units of physical capital (from k0 to k2), which is referred to as a substitution effect. On the other hand, since the relative price between these two factors (*k* and *e*) drops, the producer's real (and affordable) cost of production is enhanced. Since these two factors are normal goods, when the real (and affordable) cost of production increases, the producer will employ more units for both effective labor (from e2 to e1) and physical capital (from k2 to k1)—an income effect.

Note that in Figure 2, the producer never actually chooses point *m*, but this hypothetical point is useful in explaining the two effects that determine the producer's decision. The change from point *i* to point *m* identifies a pure change in the marginal rate of technical substitution without any change in the producer's production. Similarly, the change from point *m* to point *j* identifies a pure change in production without any change in the marginal rate of technical substitution. Consequently, the movement from point *i* to point *m* shows the substitution effect, and the movement from point *m* to point *j* shows the income effect.

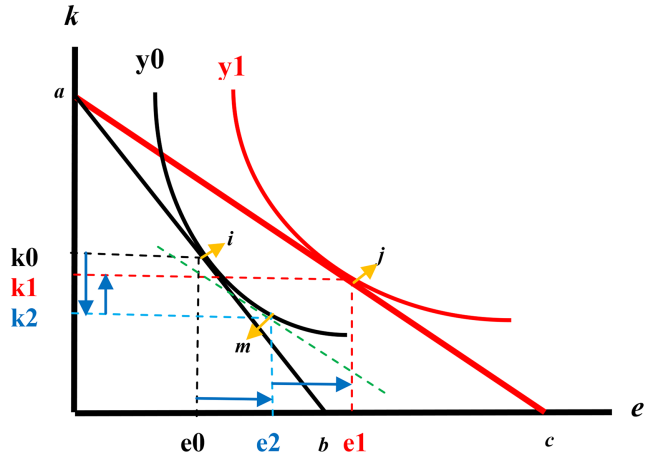

Figure 2. Equilibriums of physical capital and effective labor when JA lessons are free for learners.

In addition, it is possible that physical capital may not necessarily decrease depending on both substitution and income effects. Physical capital may likely stay at the same initial level when the substitution effect is equal to the income effect. As displayed in Figure 3, after the price of effective labor drops, physical capital still stays at the level of k0 (k0 = k3) although effective labor increases from e0 to e3 (e3 > e0), and thus the quantity rises to the level of y2. This is because the decrease in physical capital due to the substitution effect (from k0 to k2) is equal to the increase in physical capital due to the income effect (from k2 to k3 = k0). The substitution effect is completely offset by the income effect. As a result, physical capital does not change—it remains at the same initial level.

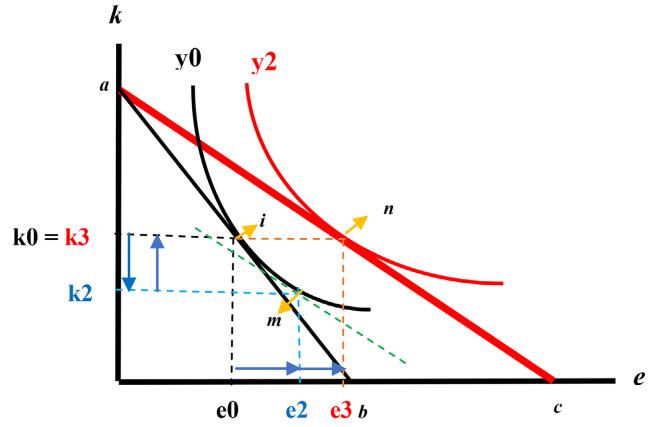

Figure 3. Physical capital remains constant but effective labor increases when JA lessons are free for learners.

As mentioned above, a community's total output is the summation of each individual firm's output (i.e., $Y = \sum_{i=1}^{n} y_i$). When each individual firm's output increases ($y_i \uparrow$), the whole community's total output will also increase ($Y \uparrow$).

We now use the theory of economic growth to decompose the contributions of technology, physical capital, and effective labor to economic growth. We recall the community's total production function, as shown in Equation (1), take natural logarithms of both sides of Equation (1), and then construct the total differential equation (e.g., Lin, 2003; Armer & Liu, 1993; etc.), which may be demonstrated as below:

$$\begin{aligned} & Y = AK^{\alpha}E^{\beta} \\ & \Rightarrow \ln Y = \ln A + \alpha \ln K + \beta \ln E \\ & \Rightarrow \mathrm{d}\ln Y = \mathrm{d}\ln A + \alpha \mathrm{d}\ln K + \beta \mathrm{d}\ln E \\ & \Rightarrow \frac{\mathrm{d}Y}{Y} = \frac{\mathrm{d}A}{A} + \alpha\frac{\mathrm{d}K}{K} + \beta\frac{\mathrm{d}E}{E}, \end{aligned} \tag{17}$$

where $\frac{\mathrm{d}Y}{Y}$ = total output growth, $\frac{\mathrm{d}A}{A}$ = technology growth, $\frac{\mathrm{d}K}{K}$ = physical capital growth, and $\frac{\mathrm{d}E}{E}$ = effective labor growth.

As discussed previously, when JA lessons are free to learners, the price of effective labor will drop, leading effective labor to increase. Therefore, given technology and physical capital, as the growth in effective labor increases ($\frac{\mathrm{d}E}{E}\uparrow$), the community's total output growth will increase ($\frac{\mathrm{d}Y}{Y}\uparrow$) eventually. In other words, Junior Achievement may indirectly contribute to a community's economic development.

5. Survey Evidence

To support our theoretical evidence, we conducted a survey in May and early June 2024. We focused on local business owners or managers in Northwest Indiana. We chose Northwest Indiana because this area belongs to the Big Chicago Area where offers JA lessons from kindergarten through twelfth-grade education. Moreover, the reason for selecting these individuals is their extremely important role in business development and hence in a community's economic development. Their strategic plans, policymaking, business administration, financial management, short-/long-term goals, etc. all can lead their businesses to succeed or fail (Abubakar et al., 2019). Therefore, these business leaders' strong financial literacy and innovative ways of thinking about starting/running a business are primary factors in successful business development and influence a community's economic development.

The questionnaire was created using Qualtrics and sent out to local business owners or managers via email. We received 98 responses from business owners or managers in five weeks (note: we understand that a sample size of 100 is needed for meaningful results. Since 98 was just slightly smaller than 100, we accepted). The survey questions are shown below:

1) *During your kindergarten through twelfth-grade education, did a volunteer from the Junior Achievement program ever come to visit your class, after-school*

program, or another setting to teach you about money, jobs, or business (*entrepreneurship*)? ____ *Yes*; ____ *No.*

If your answer for Question 1 *is yes, please continue answering the following questions; otherwise, you can stop.*

2) *Did Junior Achievement lessons ever enhance your knowledge in financial literacy*? ____ *Yes*; ____ *No.*

3) *Did Junior Achievement lessons ever increase your confidence in managing money*? ____ *Yes*; ____ *No.*

4) *Did Junior Achievement lessons ever inspire or motivate you to be an entrepreneur in your career*? ____ *Yes*; ____ *No.*

5) *Did Junior Achievement lessons ever positively influence your ways of thinking in starting or running your business*? ____ *Yes*; ____ *No.*

6) *Did Junior Achievement lessons ever positively influence your decision-making on your business*? ____ *Yes*; ____ *No.*

7) *Did Junior Achievement lessons ever positively influence your business administration and financial management*? ____ *Yes*; ____ *No.*

According to the survey, 28 out of 98 (=28.57%) had ever participated in the Junior Achievement (JA) program during their K-12 education. Twenty-four (24) of these 28 (=85.17%) who ever participated in the JA program believed that JA lessons enhanced their knowledge about financial literacy, and 23 of 28 (=82.14%) agreed that JA lessons increased their confidence in managing money. In addition, 23 of 28 (=82.14%) reported that JA lessons inspired or motivated them to be an entrepreneur in their career. Moreover, 22 of 28 (=78.57%) reported that JA lessons positively influenced their ways of thinking about starting/running their business, 21 of 28 (=75%) reported that JA lessons positively influenced their decision-making on their business, and 22 of 28 (=78.57%) reported that JA lessons positively influenced their business administration and financial management skills. The survey results are shown in Table 1 below.

Table 1. The survey results.

Questions	Yes %	No %	Responses
During your kindergarten through twelfth-grade education, did a volunteer from the Junior Achievement program ever come to visit your class, after-school program, or another setting to teach you about money, jobs, or business (entrepreneurship)?	28.57	71.43	98
Did Junior Achievement lessons ever enhance your knowledge in financial literacy?	85.17	14.83	28
Did Junior Achievement lessons ever increase your confidence in managing money?	82.14	17.86	28
Did Junior Achievement lessons ever inspire or motivate you to be an entrepreneur in your career?	82.14	17.86	28
Did Junior Achievement lessons ever positively influence your ways of thinking in starting or running your business?	78.57	21.43	28
Did Junior Achievement lessons ever positively influence your decision-making on your business?	75.00	25.00	28
Did Junior Achievement lessons ever positively influence your business administration and financial management?	78.57	21.43	28

The survey evidence shows that the majority of JA alumni agreed that JA lessons increased their knowledge of financial literacy and confidence in managing money. They also believed that JA lessons positively impacted their business decision-making, administration, management, and ways of thinking about starting/running business. Certainly, our survey evidence cannot directly demonstrate the ways in which Junior Achievement contributes to a community's economic development, but it shows how Junior Achievement positively affects a business leader's knowledge of financial literacy, confidence in managing money, decision-making about business, business administration, financial management, and ways of thinking about starting/running a business, and hence in turn contributes to a community's economic development. That is, participation in Junior Achievement may not directly contribute to a community's economic development, but it indirectly does so.

6. Conclusion

In this study, we applied the theory of producer choice to build an economic theoretical model to link the relationship between the Junior Achievement program via community service and producer behavior. We then used the theory of economic growth to derive the contribution of effective labor to economic growth and hence in turn demonstrated how Junior Achievement contributes to a community's economic growth.

We conclude that the main economic contributions of Junior Achievement to a community's economic development are as follows: 1) JA reduces the cost of education program training; 2) JA improves the quality of human capital used in business decision-making, business administration, and financial management; 3) JA increases the amount of effective labor used in production. These three contributions are of primary importance to a community's economic development.

Finally, based upon our economic theoretical model offered here in this study, we plan to conduct an empirical study that will include constructing empirical models that will permit us to further investigate this topic in the future.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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